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# Engineering Support Program (ESP)

## 2016 ANNUAL REPORT

March 4, 2017

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This publication was produced for review by the United States Agency for International Development. It was prepared by Tetra Tech.

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# ENGINEERING SUPPORT PROGRAM (ESP)

CONTRACT NO. AID-306-C-16-00010

JO-ICB-0007 Internship Program for Afghan Women in  
Engineering and Architecture  
2016 Annual Report

March 4, 2017

## **DISCLAIMER**

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## EXECUTIVE SUMMARY

The United States Agency for International Development (USAID) Internship Program for Afghan Women in Engineering and Architecture provides training and capacity building opportunities for female students enrolled in engineering, architecture, and related programs at governmental universities in Kabul, Afghanistan. The internship program began in 2011 under USAID's Afghanistan Engineering Support Program (AESP). Following AESP closeout in 2016, the program transferred to the Engineering Support Program (ESP) and is scheduled to continue through January 2019. The internship is coordinated with university leadership, but has no university affiliation.

Engineering and architecture, long considered fields unsuitable for women in Afghanistan, offer limited opportunities for recently-graduated female engineers and architects. Women are often discouraged from pursuing these career paths or are unaware that positions are available for them. ESP provides professional and practical training, while promoting gender equality and women's empowerment.

The internship program provides opportunities for interns to apply skills and concepts learned through coursework to real world situations. It is intended to provide exposure to design and collaborative processes, site visits, and practical learning experiences. Opportunities also include theory, practical experience in construction materials, quality control and quality assurance, construction health and safety, construction management, design software, program management, and other topics in the fields of civil, mechanical, architectural, structural, transportation, electrical, and environmental engineering.

The primary focus of the program is to augment the interns' theoretical education, provide professional experiences for students, and promote critical thinking skills. A secondary, but equally important purpose, is to promote gender equality in Afghanistan. The interns gain confidence and are provided experiences that are typically not offered to women. The internship program is thus carving a place for women in Afghanistan in the fields of engineering and architecture.

The program continues to evolve. Every year, the AESP/ESP project coordinators analyze the previous year's program and implement improvements for the following year. This allows ESP to provide a more comprehensive program catered to the interns' needs. Tailoring the program ensures that the curriculum is responsive to potential changes in the job market as well as any improvements in technology or practices, assisting the majority of internship graduates to pursue successful careers in engineering and architecture.

## 1.0 INTERNSHIP PROGRAM

The Internship Program for Afghan Women in Engineering and Architecture is an ESP capacity building effort. It was designed and implemented to create opportunities and lay the first stone toward the eight female interns' chosen career paths. Students who are in their last academic years in architectural and engineering studies at Kabul University and Kabul Polytechnic University are eligible to apply.

The internship program is designed to deliver a wide variety of job training throughout the year. Through this process, the interns learn valuable lessons and gain real life experiences to better equip them to be competitive candidates in their fields. Additionally, ESP provides the interns with the tools to not only succeed, but to thrive in a male-dominated field and culture.

On December 29, 2015, the internship Point of Contact (POC) and Alternate Point of Contact (APOC) met with the heads of the engineering departments at Kabul University and Kabul Polytechnic University. During these meetings, they shared the internship project's announcement letter and posted it on the universities' announcements boards.

During the month of January 2016, the submitted resumes were screened, and 15 female engineering students were interviewed. Eight students were selected to be recruited for the program. Five were studying architecture, two were studying electrical engineering, and one was studying civil engineering.

From January 30, 2016 through January 20, 2017, the students spent an average of three days a week as interns. They trained with a variety of engineers in diverse applied engineering areas. The details of the interns' training and work experiences are described in the sections that follow.

As part of the internship requirements, all eight interns were asked to write a final summary and evaluation of their experiences with the program. Two of these reports are included in Appendix A as samples.

## **1.1 BASIC CAREER SKILLS TRAINING**

In close cooperation with expatriate engineers and local national professionals, the interns were provided opportunities to apply skills and concepts learned through university coursework in a professional engineering environment.

ESP provided in-person and online training in basic career-building skills. In-person training was conducted by the ESP Management Information Systems (MIS) and Administrative Departments, and online training was provided on the Tetra Tech website. Some of the training topics are listed below:

- Microsoft Office Online Training (Outlook, Word, Excel, and PowerPoint)
- File Structures and Document Review Processes
- Effective Presentation Skills
- Technical Writing
- Meeting Protocol
- Efficient Note Taking
- Document Control

The training enabled interns to gain general office knowledge, build confidence, and elevate their communications skills.

## **1.2 ON-THE-JOB TRAINING**

On-the-job training is to provide work experience opportunities for female architectural and engineering interns to assist them in taking responsibility for conducting assignments independently and participating in team work.

An essential part of the training is to expose the interns to real-world scenarios encountered in the working world. The 2016 interns were assigned to on-the-job training that included the following tasks:

- Measuring and sketching the Tt ESP villa for creating as-built drawings of the structure
- Working closely with ESP engineers to design the architectural, civil, electrical, and mechanical sections of ESP's containerized housing units
- Reviewing contractor submittals that had previously been reviewed by ESP engineers
- Conducting assignments independently after receiving training to practice individual work

After completion of the assignments and receiving mentor feedback, the interns' understanding levels increased, especially after comparing their initial work.

## **1.3 SHADOWING EVENTS**

Shadowing opportunities connected the interns with relevant international and national organizations, from which the interns received an overall idea of daily architectural and engineering tasks. USAID



employees, Da Afghanistan Breshna Sherkat (DABS) engineers, and engineering ministry staff were among the personnel who contributed their time and support.

During the shadowing sessions, the interns held discussions with the organizations' staff members about the importance of their current engineering projects, ongoing project issues, challenges faced, and future opportunities.

In the 2016 academic year, the interns attended a Kajaki Dam project shadowing event at USAID, and a Life Cycle Management event with USAID technical and administrative staff.

Interns also attended various meetings to improve their communication skills by interacting with other professional engineers from USAID and associated organizations. Interns participated in coordination meetings for the American University of Afghanistan (AUAF) 200-Bed Women's Dormitory project, the Arghandi-Ghazni Transmission Line project, Sayedabad and Ghazni Substations project, and the Kajaki Dam project. The interns asked questions and acquired knowledge about conducting meetings.

## **I.4 SPECIALIZED TRAINING**

ESP designed the internship program curriculum in a way that allowed coverage of many engineering activities, including general office experience as well as specialized training. Specialized training covered specific engineering theories and practices that the interns need that are not always adequately covered in university classes.

The interns' educational programs were based their chosen disciplines, including architecture, civil, or electrical engineering. Specific program topics centered on these engineering disciplines and included:

- Structural Engineering (Including Applying Codes)
- Site Monitoring
- Quality Control and Quality Assurance
- Construction Management and Scheduling
- Transportation Engineering
- Health and Safety in Engineering
- General Civil Engineering
- General Architectural Knowledge
- General Electrical Engineering

In addition to these topics, training included supplemental workshops, shadowing events specific to their profession, site visits, and software training during the internship program. A summary of the specialized training is included below.

### **I.4.1 ENGINEERING DOCUMENTATION**

A major part of engineering design is the development of engineering documents. This was, therefore, a focus for the interns throughout their internship period.

All interns participated in the design development of Tt villa's upcoming containerized housing unit expansion, as well as creation of villa entrance door drawings.

All interns were expected to improve their technical writing skills. As part of the Internship Program, they were expected to report on their internship experience in the form of memos and reports. After they drafted each document, they were provided feedback on report organization and technical writing.

#### **I.4.2 PRACTICAL ENGINEERING**

The interns worked directly with lead expatriate engineers and local national engineering professionals in a team environment to learn work processes, gain experience in teamwork, ask pertinent questions, and learn from the engineers' experience. The interns performed a variety of routine engineering assignments as training exercises, with supervision. Engineering tasks included reviewing simple plans and submittals and computing basic engineering calculations under the supervision of their trainers.

#### **I.4.3 PROJECT ESTIMATION**

The content of the project estimation training curriculum covered project cost management and construction material estimates. The interns were assigned to this training for one month. The workshops covered project estimation, project costs, material estimation, and other general information related to engineering. Interns also worked on drawings and calculations for their assignments.

#### **I.4.4 PROJECT MANAGEMENT WORKSHOP**

ESP Project Controls Department staff trained the interns for over two months. Training topics included project management, quality control and quality assurance, construction management, scheduling, performing assignments, work load balancing, and general discussions. Trainers assigned the interns to review a bi-weekly report based on data provided from the construction site of a Tt project.

#### **I.4.5 INVOICE REVIEW PROCESS**

ESP Project Controls Department personnel prepared and conducted training on the invoice review process to the eight female engineering and architectural interns. Training covered non-conformance reports, schedule review reports, invoice review procedures, observation reports, and other related topics. The training duration was one month and covered theory and practical assignments. Interns were assigned to review and process an invoice for capacity building and share it with their trainers for review and comments.

#### **I.4.6 ELECTRICAL TRAINING**

Electrical engineering interns received specialized training from the ESP Electrical Engineering Department. The interns received updated information about their fields and ESP projects and were asked to conduct specific activities and assignments related to the topics. Training covered electrical codes and standards, electrical specifications, electrical calculations, electrical equipment, lighting, and electrical estimations.

### **I.5 TECHNICAL WORKSHOPS AND MATERIAL TESTING**

Workshops served as a major training component aimed at supplementing the interns' formal education and providing them with practical experience. Some workshops were required for all interns. However, others were tailored to the interns' personal interests. The workshops varied from in-depth hands-on events to detailed discussions with various engineers on specific topics.

#### **I.5.1 CONCRETE AND AGGREGATES**

The purpose of this workshop was to prepare the interns for future engineering activities in construction materials testing. ESP scheduled a workshop to help interns learn how to design a concrete mix for specific concrete performance parameters, how to perform the batching and mixing of a concrete mix design, and how to perform various concrete and aggregate tests in the laboratory.



The content of this curriculum included a workshop which focused on mix design, concrete mixing activity and calculations of cement, aggregates, sand, and water amounts for different types of concrete. The workshop also included hands-on concrete testing in the lab (concrete strength, slump tests, etc.).

The interns were exposed to concrete mix design tests and aggregate tests at labs several times. Since ESP engineers were responsible for monitoring contractors' material testing at the labs for actual ongoing projects, some of the interns traveled with them to the labs for the monitoring activities.

### **1.5.2 SOIL**

The soil workshop included lectures on soil mechanics theory and hands-on soil testing in the lab, including California Bearing Ratio (CBR) test, moisture content, Atterberg limits, proctor tests, and soil classification. This training consisted of two phases: a lecture on soil mechanics, usage, and methodology for performing tests, and witnessing tests performed by lab technicians. The interns were instructed in five different soil tests and their applications.

### **1.5.3 ASPHALT**

The interns received lectures on asphalt theory and hands-on asphalt testing in the lab. The ESP Civil Engineering Department held an asphalt workshop in two parts, which included a lecture on asphalt composition and creation with emphasis on application to road construction, and tests to use while building roads. During the lab portion of this workshop, the interns witnessed tests being performed by lab technicians. ESP engineers accompanied them during this visit.

### **1.5.4 STEEL**

Interns received lectures on steel theory and steel testing at the lab. They joined a steel class at the Tt ESP villa that was prepared and presented by engineers. Following the class, ESP engineers and interns witnessed and inspected steel tests that were performed by contractors for several ESP projects.

## **1.6 SOFTWARE TRAINING**

The use of software in architectural and engineering designs expedites the design process, improves accuracy, saves time and paper, and allows for more design options. ESP provided training to the interns in current, applicable software that is necessary for them to learn how to design projects. The software training that was provided is listed below.

### **1.6.1 COMPUTER-AIDED DESIGN (CAD)**

Basic and advanced tutorials on AutoCAD software were provided. Advanced work was provided for interns interested in more comprehensive knowledge about the CAD system. Interns learned ESP and USAID AutoCAD standards through training that included:

- An Introduction to AutoCAD
- Setting up a Template
- Exposure to the AutoCAD Workspace and Layout
- Menus and Shortcuts
- Use of Basic Drawing, Editing, and Viewing Tools
- Organizing Drawing Objects in Layers
- Inserting Reusable Symbols (Blocks)
- Adding Text, Hatching, and Dimensions

- Use of Scales
- Preparing a Layout to be Plotted
- Plotting a Drawing
- A Practical AutoCAD Project

The training was conducted for over one month, and interns were assigned several AutoCAD drafting projects for their capacity building.

### **1.6.2 AUTOCAD CIVIL 3D**

Basic tutorials in AutoCAD Civil three dimensional (3D) software were provided and included:

- Introduction to AutoCAD Civil 3D
- Preparing a Topographical Plan
- Creating Points, Surfaces, Alignment, Profiles, Corridors, and Sections
- Geometric Design of Roads
- Practical Sample Project

This training was held for over one month and included a road design example in the civil 3D program.

### **1.6.3 GEOGRAPHIC INFORMATION SYSTEM (GIS)**

ArcGIS (map) training was provided in GIS to all interns for two to three hours a week over a one month period. Training included a basic introduction to the ArcGIS software application, as well as assignments to practice the applications.

The content of this training provided an introduction to GIS and included: ArcMap interface and tools, data view, layout view, layers, data frames, map elements, layer properties for symbols and labels, tools for examining data, working with selection tools, metadata, geographic data review, linking features and attributes, data formats, working with the Arc Catalog, editing spatial data, editing attribute data, geo-referencing, coordinate systems, datum, projections and distortion, projecting data, table structures, data types, table manipulation, connecting tables, working with graphs and reports, basic cartographic concepts, creating maps in ArcMap, and printing and plotting maps.

### **1.6.4 POWER LINE SYSTEMS – COMPUTER AIDED DESIGN AND DRAFTING (PLS CADD)**

PLS CADD is a useful software program that is not commonly available. ESP hired a PLS CADD trainer to train several electrical and civil engineers. The civil intern was interested in learning this software and attended the class. Attendees received an overview of pole design, tower design, and transmission line design. They learned how to insert survey data and points from the total station into the software, how to design and enter characteristics of each transmission line, how to generate a final design report, and other tools. The training included a practical example in designing a tower for one ESP project. Individuals were asked to design a tower and share the design with colleagues.

### **1.6.5 MICROSOFT (MS) PROJECT**

This training covered an introduction and overview of MS Project software, activity breakdowns, sequencing activities, assigning resources, assignment durations, developing and controlling a schedule, and automatically leveling and viewing resources. At the end of the training, the interns prepared a schedule for the construction of electrical towers.

## **1.6.6 ENVIRONMENTAL PROTECTION AGENCY NETWORK (EPANET) 2**

This training covered an introduction and overview of hydraulic design calculations for different types of water supplies, distribution, and treatment systems. At the end of the training, the interns were asked to design a water supply system for residential apartments in the Kabul area as a practical example.

## **1.7 SITE VISITS**

Site visits allowed students to see concepts learned in theory applied to actual practice. ESP provided opportunities for the interns to visit safe construction site areas since visiting construction projects is off limits in Afghanistan for female engineers. Most of them are not able to visit sites due to security concerns and the lack of opportunity. Prior to visiting construction sites, interns received health and safety training at the ESP office.

During the internship period, interns participated in ten site visits. Two visits took place at the United States (US) Embassy compound, one at the Tarakhil Power Plant, three at the Sardar Girls' High School, and four at the American University of Afghanistan (AUAF) Women's Dormitory.

The visits that took place at the US Embassy compound were held in two stages. The first was related to the site's preparation for construction. The second was related to the buildings under construction and concrete placement for new embassy housing and offices. These visits were led by USAID and US Embassy construction engineers. The interns viewed the construction site and were able to ask questions directly to site and contractor project managers.

Interns visited the Tarakhil Power Plant after coordinating their visit with officials from USAID and DABS, the Afghanistan national utility company. DABS operational engineers and ESP engineers accompanied the eight female engineering and architectural interns during this visit. The interns toured the power plant and received information about the treatment room, hydrant system and water tank, power house, 11 kilovolt to megavolt (kV - MV) generator switchgear, the power control room, the 110 kV step-up substation switchyard, and the fuel tank.

Interns also witnessed concrete placements and installation of fire doors at the Sardar Girls' High School, which was a new experience for them.

Interns visited the AUAF New 200-Bed Women's Dormitory project construction site several times while the project was in different stages of construction, including site civil works, formwork, steel reinforcement, concrete placement, masonry walls, and other activities. During the visits, the contractor's site engineers and ESP quality assurance (QA) engineers accompanied the interns and responded to their questions.

Prior to joining the internship program, most of the interns had not experienced site visits. After receiving health and safety training and attending site visits, interns became more confident in safely conducting site visits and familiarizing themselves with different aspects of the sites.

## **1.8 ORAL PRESENTATIONS AND PUBLIC SPEAKING SKILLS**

Communication is an important aspect for all business settings and is often not emphasized in science related fields. It is important that communication be included as part of any workplace learning experience. Tasks covered under internship communication training included:

- Document Control, including Filing Procedures and Structures
- Technical Writing (Memos, Reports, Emails)
- Meetings, including Etiquette, Preparation, and Minutes
- Presentations, Public Speaking, and Microsoft PowerPoint Design

Technical writing training was an ongoing activity and included general writing, writing rules, and writing memos, quarterly reports, and final reports. After receiving the training, the interns were asked to write assignment memos following the completion of each activity. After the interns drafted the memos, they submitted them to two reviewers, who included the project POC and a technical writer from the Management Information Systems (MIS) Department. During several reviews of the memos, the interns gained experience and developed their technical writing skills.

Other writing assignments, such as engineering presentations and describing their experience with the internship program, were also provided. The interns were instructed on how to prepare an appealing, official presentation, how to present it effectively, and how to write a conclusion for the presentation. Review procedures for the assignment memos also applied to reviews of the .

Mid-way through the program, the interns provided a presentation to Mr. , Tt Executive Vice President, and Mr. , ESP Chief of Party. The interns included information about what they learned during the internship program, why they chose to become engineers / architects, and their expectations and recommendations for the internship program.

## **1.9 ASSIGNMENTS**

The females enrolled in the ESP internship program developed engineering skills by receiving on-the-job training. After on-the-job training was obtained, the interns performed assignments to build their capacity. While these assignments were not designed to support the ESP workload, the interns attended theoretical and practical training sessions. They shadowed ESP expatriates, local staff, and USAID engineers as they completed their daily activities.

After completion of each activity, whether it was specialized training, material testing at a laboratory, or software training, the interns were tasked with assignments. When the assignments were completed, they were shared with the intern's trainers for review and comments. After revisions were made, the assignments were finalized and approved.

## **1.10 CAREER DEVELOPMENT TRAINING**

The interns' career development training consisted of two sections: 1) creating opportunities to connect with other USAID implementing partners and Afghan ministries to assist them with finding jobs, and 2) professional development training that included resume preparation and interview skills.

ESP invited staff from USAID's Women's Leadership Development (WLD) program to provide information on the components of this project. The WLD program enables young women to become future leaders in different sectors of the country. After preparatory meetings, WLD staff briefed the interns on the Jawana Women's Leadership and Empowerment Course, a USAID initiative that includes leadership and management training for educated Afghan females between the ages of 18 and 30. The interns received application forms to submit as part of official procedures for participating in the course.

Additionally, the interns attended a recruitment event with the DABS Human Resources (HR) Department. The interns received information on how to apply for DABS vacancies, and they were encouraged to apply for current job opportunities.

The second part of career development training covered the following training:

- Resume Preparation
- Cover Letter Preparation
- Interview Tips and Skills
- Mock Interviews

The resume workshop included a presentation on resume structures, the difference between a curriculum vitae (CV) and a resume, and discussions on how to tailor a CV to different positions. Each intern had an opportunity to discuss their personal resumes and to present revisions for professional reviews. The ESP HR Department covered interview tips and skills required to support interns in participating in successful interviews. Professional interview training was also conducted, which included mock interviews with individual feedback from interviewers. The interview panel consisted of ESP expatriates, local engineer leads, and HR Department staff.

## **2.0 ANNUAL PRESENTATIONS**

Annual presentations are part of the internship program work plan, through which the interns deliver presentations at two partner universities. Presentations summarize the interns' backgrounds, professional goals, and internship experience to inform other female engineering students about internship program opportunities. Prior to finalizing the presentations, the interns prepare and present them to the ESP POC, APOC, Chief of Party (COP), Deputy Chief of Party (DCOP), and other interested staff members at the Tt ESP villa. The interns receive and apply feedback and comments from attendees on their presentations. For the 2016 internship program, all of the procedures for preparing the presentations were conducted accordingly.

The ESP COP, DCOP, and POC will coordinate meetings with deans and professors at Kabul University and Kabul Polytechnic University to discuss recognition of the Internship Program and its academic value. USAID will be informed about these meetings prior to their occurrence.

Following acceptance of a Memorandum of Understanding (MoU) or program recognition by university authorities, ESP will coordinate the opportunity for 2016 interns to provide their annual presentations at the involved universities.

Coordination and arrangements for these two activities are anticipated to occur between April and May, 2017. The 2017 interns will also present their annual presentations at the end of the academic year to encourage eligible female students to apply for the program. This activity will be scheduled for November 2017.

## **3.0 SUMMARY AND ANALYSIS**

The 2016 Internship Program for Afghan Women in Engineering and Architecture covered practical engineering workplace topics crucial to the development of young female engineers' careers. Topics included basic workplace tasks, such as technical writing, engineering design, engineering calculations, and training in common engineering software. Program experience also included lessons in more specific engineering topics, such as transportation engineering and construction site visits. These lessons were coupled with shadowing events with experienced engineers from a variety of backgrounds to prepare interns for working on real world engineering projects and dealing with ongoing challenges in the engineering field. The interns were familiarized with a professional working environment, communication skills, project deadlines, how to deal with individual activities and assignments, and how to become an active team member.

The internship's structure serves as a basis to build upon and improve for future iterations of the program. Every year, the curriculum is structured to cater to the engineering field of the interns who are hired. However, there are certain improvements that ESP will put in place for 2017.

ESP will provide more opportunities for site visits. The program also intends to include more tests of construction materials at the lab. The upcoming year will introduce new subjects, including QA responsibilities in reviewing design drawings, construction submittals, and site inspections. ESP would also like to provide more opportunities for interns to improve their presentation skills and to increase their awareness of opportunities for women in Kabul.

The training curriculum supports the learning objectives of the internship program through practical education, workshops, hands-on training of various engineering techniques, and lessons in engineering software. The curriculum mirrors the skills that the interns will need for their future careers. Each year, enhancements help the internship program grow into an even greater resource to advance the education and careers of young women in Afghanistan.



## **APPENDICES**

### Appendix A – Final Reports

## APPENDICES

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## APPENDIX A – FINAL REPORTS

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**USAID**  
FROM THE AMERICAN PEOPLE



# Engineering Support Program (ESP)

## FINAL REPORT – [REDACTED]

December 29, 2016

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## 1.0 INTRODUCTION

The Internship Program for Afghan Women in Engineering and Architecture, which is funded by USAID and implemented by the Tetra Tech (Tt) Engineering Support Program (ESP), is an effective program for increasing Afghan women's professional capacities in the fields of engineering and architecture. I found the program to be a golden opportunity for me to further develop my skills as a professional architect. I am grateful to have joined this program because it educated me in a various ways by providing different training, such as shadowing events, specialized training, material testing training, and technical training. The aim of all of the training was to enable me to become ready for my future career.

I have always wanted to see practical construction work on engineering projects. As our school faculty was unable to provide these opportunities to us, we learned only theoretical practices from books. Fortunately, ESP provided site visits and practical work opportunities for me to make my dream a reality. For example, I now have site construction experience since I visited the American University of Afghanistan (AUAF) construction site, where I saw each construction phase, step-by-step. I can now use my experience with practical work as an architect in my future career.

## 2.0 ACTIVITIES

I participated in effective activities during my one-year internship with ESP. Each was important to my professional capacity and growth in engineering and architecture fields. For example, site visits, practical work, on-the-job training, software training, technical training, and specialized training all provided opportunities for me to learn. This also enabled me to work better in an office environment as an intern and will help me work more effectively as a professional architect in the future. The activities below were provided as part of the internship curriculum.

### 2.1 SITE VISITS

**Table I – List of Site Visits**

NO.	TOPIC	DATE
1	Sardar Kabuli Girls' High School Site Visit	June 2016
2	AUAF Dormitory Under Construction Building Site Visit	July 21, October 19, November 17, and November 28, 2016
3	US Embassy Under Construction Building Site Visit	August 4, 2016
4	Tarakhil Power Plant Site Visit	November 22, 2016

Site visits provided practical experience and knowledge and are some of the most beneficial aspects of the internship program. Through each site visit listed above, I gained practical knowledge. The Sardar Kabuli Girls' High School site visit taught me about the installation of fire rated doors and concrete mix design. The AUAF Dormitory site visit taught me about construction phases of a project. The US Embassy construction site visit taught me about construction of a complex building site and to consider international standards. The Tarakhil Power Plant site visit taught me about power producing systems, and I observed the elements of a power plant.

All of the site visits were beneficial for my practical experience and skills. We did not have any site visits during university due to lack of opportunities, especially for female architects. Fortunately, during

my internship period, ESP provided us with beneficial site visits because technical personnel and ESP engineers know that practical work can enhance hundreds of hours of theoretical studies and information gained from books.

I liked the US Embassy construction site visit the most because I learned new information about the construction of complex facilities. I also learned information about engineering systems, including mechanical, electrical, and civil systems.

From the site visits, I came to know mechanical and electrical engineering systems. Additionally, I learned information about construction materials, like gypsum board, fire-resistant material, insulation, sound barriers and vapor barriers.

## 2.2 ON-THE-JOB TRAININGS

**Table 2 – List of On-The-Job Trainings**

NO.	TOPIC	DATE
1	Review of AUAF Women's Dormitory – Architectural Discipline Drawings	January to December 2016
2	Working on Draft and Measurement of Tetra Tech Villa Elevations	April to May, 2016
3	Architectural Drawings of Tetra Tech Containerized Units	August to October, 2016
4	Site Survey for Tetra Tech Containerized Units	October 2016
5	Tetra Tech Villa Painting Area	November 2016
6	Tetra Tech Villa Boundary Security Screen Calculations	December 2016

On-the-job training is training that can include office and practical work for a technical person. All on-the-job training I received at ESP was effective in familiarizing me with office engineering works, such as review of the AUAF Women's Dormitory architectural drawings, as I am now more familiar with the architectural elements of a project.

While working on the draft and measurement of Tt's villa elevations, we measured all horizontal and vertical dimensions for a new wall for containerized units. Then I drafted it on Automated Computer-Aided Design (AutoCAD), using the principles of the software.

I worked on architectural drawings of Tt's containerized units and how to adjust the units and their stairs and doors to provide sufficient space for an occupant. I also participated in a site survey for the Tt containerized units to find specific contour lines and the difference in elevations at the Tt site and villa. During the villa painting area training, I learned how to measure a specific area and calculate its painting costs. During the Tt villa boundary security screen calculations, I learned how to measure spaces and find the perimeter of a boundary.

All on-the-job trainings were beneficial for my internship process because as an office employee, I should be familiar with office works and drawing. Architectural field measurements, calculations, project drafts, and software are very important.

I liked drafting and measuring Tt villa elevations the most because drawing and drafting are directly related to the field of architecture.

I learned very effective lessons from these on on-the-job trainings, such as accurate measurements of horizontal and vertical dimensions. I also learned how to draft a drawing with AutoCAD software, and I learned about as-built drawings.

## 2.3 SHADOWING

**Table 3 – List of Shadowing Opportunities**

NO.	TOPIC	DATE
1	Kajaki Dam Shadowing at US Embassy	May 12, 2016
2	Life Cycle Management Shadowing at US Embassy	December 6, 2016

Shadowing events are educational for interns and can help them to learn about particular occupations or professions. We had two shadowing sessions during our internship program. The first was for Kajaki Dam at the US Embassy, where we learned about the history of the dam and electrical capacity. The second was for life cycle management, where we learned about project processes and the steps required to have a successful project. The shadowing events had a great impact on my experience and increased my knowledge.

I was most interested in Kajaki Dam because, during this shadowing, I learned new information about electrical engineering and the production of electricity.

I came to understand the importance of water and power production. I learned information about Kajaki Dam's history, its electric capacity, and about the North East Power System (NEPS) and its importance in providing low cost power to Kabul.

## 2.4 SPECIALIZED TRAINING

**Table 4 – List of Specialized Trainings**

NO.	TOPIC	DATE
1	Health and Safety Training	March 14, 2016
2	International Building Code (IBC)	April 17, 2016
3	Project Management Training	May 26, 2016
4	Water Supply Training	August 20, 2016
5	Invoice Audit Process Training	November 5, 2016

Specialized trainings were the main part of our internship program to promote skills in engineering, technical capabilities, and office work by expert trainers. From health and safety training, we were taught to consider safety rules during construction at a site. Through international building code (IBC) training, we were taught the importance of codes for design and construction. In project management training, I learned how to manage all tasks and activities on an engineering project. During water supply training, I learned about water distribution to residents during a project. In invoice audit process training, I learned about analysis, checks, and audits of incoming invoices from a contractor.

Specialized training is very important for technical persons, like architects, to learn important information about site works and to help them do their best while working in an office.

Of all the specialized training provided, I liked the health and safety training the most because it is important in all site construction phases that it be considered by everyone involved. I learned from this training that body protection is an important consideration, because human beings have only one body. We should take care of our bodies and protect them from the hazards of work sites. We must wear gloves for hand protection, hats for head protection, steel-toed shoes for foot protection, safety glasses for eye protection, and ear muffs for ear protection.

## 2.5 MATERIAL TESTING

**Table 5 – List of Material Testing**

NO.	TOPIC	DATE
1	Soil Test in the BASE LAB	April 5, 2016
2	Steel Test in the BASE LAB	April 6, 2016
3	Gravel Test in AXIOM LAB	December 15, 2016

We had three laboratory (LAB) visits to observe tests. The first was a soil test in the BASE LAB, where we saw different types of soil and learned about their properties. The second was a steel test in the BASE LAB, where we tested the strength of steel plates and angle iron. The third was a gravel test in the AXIOM LAB, where we learned about different types of gravel, gravel sizes, and properties.

Material testing is another important consideration for engineers and, fortunately, we participated in three material tests where we became familiar with standards and equipment that are considered in laboratory tests.

Of all the material tests, I was most interested in the steel test because I am interested in steel frames and steel construction. I knew that steel frame structures have more strength than concrete and other materials and that steel occupies less space.

From the steel test, I learned to always test steel according to its strength, toughness, ductility, weldability, and durability properties, and to test these properties on different types of steel, like steel plates and angle iron, to find the exact strength of steel for construction.

## 2.6 TECHNICAL WORKSHOPS

**Table 6 – List of Technical Workshops**

NO.	TOPIC	DATE
1	Technical Writing Training	March 14, 2016
2	Effective Presentation Training	April 14, 2016

Technical training was also effective, interesting training provided to all of the interns. We had two of these trainings; one in technical writing and one on effective presentations. We learned which points should be considered when we write a memo, email, report, or official letter. For example, we should know our audience and that, for technical and non-technical audiences, our writing and use of words should be different. In presentation training, we became familiar with preparing and presenting an effective presentation.

The technical writing workshop was necessary to promote interns' skills because when we work in an office, it is important to know how to write certain documents and communicate well. The most beneficial thing I learned from the two technical trainings was creating effective presentations because it is directly related to my field as an architect, and it is important for me to present my project in the best way possible.

I learned that when creating a presentation, we should consider these three phases: 1) before preparing a presentation, we should have enough information about the subject we want to present; 2) when creating a presentation, we should consider the slide colors, content, text style, and amount of text to avoid audience eye strain; and 3) at presentation time, we should consider time, body language, eye contact, and voice to make the presentation interesting for the audience.

## 2.7 SOFTWARE TRAININGS

**Table 7 – List of Software Training**

NO.	TOPIC	DATE
1	MS Office Software Training	February 10, 2016 to March 10, 2016
2	AutoCAD Software Training	February 24, 2016
3	Adobe Photoshop Software Training	April 24, 2016
4	MS Project Software Training	May 26, 2016
5	GIS Software Training	June 26, 2016
6	EPANET Software Training	September 10, 2016
7	Primavera Software Training	November 23, 2016

We had software training (Microsoft Word, Excel, and PowerPoint) to increase our knowledge, which helped me write memos and reports during the internship. It also helped me prepare a presentation.

We also had AutoCAD software training for drafting projects, Adobe Photoshop training for editing a project model, and MS Project training for managing activities during an engineering project. Geographic Information System (GIS) software training was used for analysis of a geographic map, Environmental Protection Agency Network (EPANET) training was used for water supply purposes, and Primavera software training was used for scheduling tasks and activities in an engineering project.

To present a project like a professional architect, we need to have a tool to display the project for others to view. All the software programs we trained with are tools to present and display projects effectively.

I liked AutoCAD and Photoshop training the most because they are directly related to architecture. From AutoCAD training, I learned the method for drafting architectural projects, like plans elevations, sections, and details. From Photoshop training, I learned how to edit project drawings, like plans, elevations, sections, and 3D forms. Additionally, I learned how to design a poster and arrange it on a sheet using styles and methodologies to illustrate my ideas for others.





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# Engineering Support Program (ESP)

FINAL REPORT – [REDACTED]

December 29, 2016

## DISCLAIMER

This publication was produced for review by the United States Agency for International Development. It was prepared by Tetra Tech.

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# ENGINEERING SUPPORT PROGRAM (ESP)

CONTRACT NO. AID-306-C-16-00010

JO-ICB-0007

Internship Program for Afghan Women in Engineering  
and Architecture – 2016 Academic Year  
Final Report –

December 29, 2016

## **DISCLAIMER**

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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## 1.0 INTRODUCTION

The Internship Program for Afghan Women in Engineering and Architecture was established to increase the practical knowledge of female engineers and architects and encourages female engineers to work in their field. The women's internship program is funded by USAID and implemented by the Tetra Tech (Tt) Engineering Support Program (ESP). This program changes the lives of female engineers by providing training in their selected professional fields. It provides opportunities for fourth and fifth year university engineering and architecture students to improve their knowledge. In 2016, as a fourth year student of civil engineering at Kabul University, I had the opportunity to join the program. It provided me with important practical knowledge by offering different learning opportunities and afforded me the chance to work with Tt expatriates and become familiar with office work.

The one-year internship program helped me to get much closer to my career goals and trained me to become a professional in my field. After graduating from the program, I aim to work for my country and help or courage other girls to achieve their educations.

## 2.0 ACTIVITIES

In the one-year internship, I participated in interesting activities that helped me improve my knowledge base and get closer to my goals. The activities improved my technical, theoretical, and practical knowledge. They included site visits, on-the-job training, shadowing events, specialized training, material testing, technical workshops, and software training.

### 2.1 SITE VISITS

**Table 1 – List of Site Visits**

NO	TOPIC	DATE
1	Sardar Kabuli Girls' High School (Fire Rated Doors)	June 5, 2016
2	AUAF Women's Dormitory Construction Site	July 21, October 19, November 17, and November 28, 2016
3	US Embassy Under Construction Buildings	August 4, 2016
4	Tarakhil Power Plant	November 22, 2016

Site visits were one of the most important activities during the internship period. The Sardar Kabuli Girls' High School site visit was about fire rated door replacements. I learned that the doors should meet Life Safety Code National Fire Protection Association (NFPA) 80 requirements.

I participated in a visit to the AUAF Women's Dormitory construction site to observe practical step-by-step information about construction of the dormitory, the importance of safety on site, the work plan for a project, sub-structures, super-structures, and utilities.

The program afforded me a chance to visit US Embassy buildings under construction and learn about the importance of meeting standards and learning about utility systems. I also had an opportunity to visit the Tarakhil Power Plant and learn about firefighting systems.

The main purpose of the site visits was to improve our practical knowledge and make us familiar with under-construction site works. ESP understands the limitations and lack of opportunities that females have for site visits during university, and they created opportunities for us to visit under-construction

sites. The site visits were very beneficial for my career, now and in the future, as I received answers to hundreds of questions that have developed during my class lectures.

I liked the AUAF Women's Dormitory construction site visit the most because I had information about the design and drawings of the dormitory before the site visit. Additionally, I had four site visits to the dormitory. The first was about safety during construction and temporary utility systems. The second was about column reinforcement methods and concrete masonry unit (CMU) wall construction methods. The third visit was about slab reinforcement systems, and the fourth was about pouring concrete in slabs.

The most important lesson I learned from the site visits that can be applied at construction sites was that of safety. I also learned about project work plans and information about sub-structures, super-structures, and utility systems for construction in a buildings.

## 2.2 ON-THE-JOB TRAININGS

**Table 2 – List of On-The-Job Trainings**

NO	TOPIC	DURATION
1	Tetra Tech Villa Containerized Housing Unit Drawings	Four Months
2	Tetra Tech Villa Survey	One Week
3	Tetra Tech Villa Painted Area Estimation	Two Weeks

On-the-job trainings were effective for my career as they taught me how to work with a group of colleagues, which was very interesting to me. I participated in working on Tt villa's containerized unit drawings for the sanitary sewer system, architectural plans, and storm drainage system drawings. Tt provided me the opportunity to survey the villa and determine the height difference between points and draw the topographic map. I worked with a group of interns who were assigned to estimate the villa's painted area, and I was also a member of a group that measured all of the dimensions and determined the painted area.

On-the-job trainings were important activities in our internship program. They familiarized me with the practical side of my field, with a working group, and office work.

I found all of the on-the-job trainings beneficial, but I liked the Tt villa survey the most because I have attended survey courses at university, where I received theoretical knowledge, and I applied the training to this task. Though Tt's villa survey, I learned how to use survey instruments, about data collection, data calculations, finding the height difference between points, and how to use Automated Computer Aided Design (AutoCAD) Civil 3 dimensional (3D) software to draw a topographic map.

## 2.3 SHADOWING

**Table 3 – List of Shadowing Opportunities**

NO.	TOPIC	DATE
1	Kajaki Dam Shadowing at USAID	May 12, 2016
2	Life Cycle Management Shadowing at USAID	December 6, 2016

Shadowing was also a part of our activities during the internship. This included meeting with USAID engineers and receiving information or discussions on a specific topic. I experienced two shadowing events: the first was for Kajaki Dam and the importance of this project, and the second was about life cycle management, which is important in an engineering project, but was unknown to me prior to this event.

Job shadowing is beneficial because it gives us a chance to meet professional engineers and allows them to share their knowledge with us. It also enables us to learn about important engineering topics that we had no knowledge of before.

The most interesting shadowing event for me was life cycle management since I did not have any information about this topic before. In a life cycle management presentation, I learned about life cycle phases for a system (development, manufacturing, test and evaluation, deployment, operations, maintenance, training, and disposal), the effects of operations, plus maintenance of other phases and consideration of operations and management from the start of a design phase.

## 2.4 SPECIALIZED TRAINING

**Table 4 – List of Specialized Trainings**

NO.	TOPIC	DATE
1	Health and Safety Training	March 28, 2016
2	International Building Code (IBC) Training	April 17 and 20, 2016 May 5, 2016
3	Project Management Training	May 23, 2016
4	Water Supply Training	August 20 to 25, 2016
5	Invoice Process Training	November 5 to 12, 2016

Specialized trainings were presented to us as part of the internship curriculum and contained important topics to increase our technical knowledge. In the first, we were provided with health and safety training to become familiar with safety and its importance as well as site protection equipment.

International building code (IBC) training provided information about different codes and instructed us on how to use IBC in designs. I also participated in project management training, which contained information on how to make a schedule for a project. Water supply training was provided to define possible ways for supplying water. I also participated in invoice process training, which was provided to create an invoice audit report.

Specialized trainings contain vital topics for interns to know before the start of work in any organization. The most interesting training for me among the specialized trainings was in project management because, after that training, I was tasked with making a schedule for a project. Through project management training, I learned how to define activities for a project, create continuity between activities, define the critical path for a schedule, track the progress of a project, and other topics.

## 2.5 MATERIAL TESTING

**Table 5 – List of Material Testing**

NO.	TOPIC	DATE
1	Steel Testing in the BASE LAB	April 5 and 6, 2016
2	Aggregate Testing in the AXIOM LAB	December 15, 2016

The internship program provided opportunities to visit laboratories (LABs) and observe the testing of different materials. I participated in two LAB visits. One was for testing the tension of steel plates with different lengths and weights. The other was an aggregate test, which covered specific gravity tests, elongation tests, and flakiness tests. We also learned about standards that LABs use for testing.

The aggregate test was interesting to me as I had the opportunity to be part of a team that sampled aggregates. I had information about sampling and testing procedures, and seeing the tests conducted in person was a good experience for me. I learned about types of gravity for aggregates: apparent specific gravity, relative specific gravity, and how to find the specific gravity of an aggregate.

## 2.6 TECHNICAL WRITING WORKSHOPS

**Table 6 – List of Technical Workshops**

NO.	TOPIC	DATE
1	Technical Writing Training	March 14, 2016
2	Effective Presentation Training	April 14, 2016

Technical writing workshops were also a part of the program. One was in technical writing, which taught us to write technically and satisfactorily for our audience. The other was about creating and presenting an effective presentation to provide information.

In addition to having technical knowledge related to our fields, it is important to have knowledge about effective communication, writing, and presenting.

Both technical workshops were beneficial for me, but I liked technical writing training more because it helped me to write technically and transfer my ideas in the best way possible. I learned that before I write, I should be aware of audience types and different ways to edit a written report. I also learned about writing memos.

## 2.7 SOFTWARE TRAININGS

**Table 7 – List of Software Training**

NO.	TOPIC	DATE
1	AutoCAD Training	February 24, 2016
2	Microsoft Project Training	May 26 to June 26, 2016
3	Primavera Training	November 1, 2016

4	EPANET 2 Training	September 10, 2016
5	Civil 3D Training	October 1, 2016
6	Photoshop Training	April 24 to May 19, 2016
7	GIS Training	June 26, 2016
8	Microsoft Office Online Training	February 17, 2016

Software training was also a part of our program, and we received training based on our fields of study and other dependent software. From the first days of our internship program, I received online Microsoft Office training (Outlook, Word, Excel, PowerPoint, and Access) to acquire first-hand information about working with the software. I also participated in automated computer-aided design (AutoCAD) software training to become familiar with 2-dimensional (2D) and 3D drafts. Photoshop is an important software to learn for interior design. We used Microsoft Project software to schedule and track the progress of a project. I learned to insert activities in the software by assigning links, resources, and updating the schedule.

We used Geographic Information System (GIS) software to find points on a map and easily edit it. We learned that Environmental Protection Agency Network (EPANET) 2 software is used to design a water supply system, Primavera software is used in scheduling, and AutoCAD Civil 3D software is used to design roads and highways.

The women's internship program covered all of the important training I needed to have before applying for engineering jobs. All of the software trainings were beneficial, but I liked Microsoft Project and Civil 3D training the most as one is about scheduling, and the other is about road design using survey data. As a civil engineering student, I have received many lectures on theoretical practices regarding scheduling and road design, but working with these two software programs was extremely interesting for me.

### 3.0 ACKNOWLEDGEMENTS

The internship program is very effective for educating female engineers. I want to thank USAID for supporting the program and Tt for implementing it. I also want to thank Tt engineers and other expatriates for sharing their experience and work with us. A special thanks goes to our supervisor for managing the program according to our knowledge and needs.

### 4.0 RECOMMENDATIONS

The women's internship program was very interesting and provided me with a great deal of practical knowledge. Going forward, I recommend that important information about construction sites, including seeing the designs, drawings, and schedules, be incorporated prior to site visits to help interns learn as much as possible.

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